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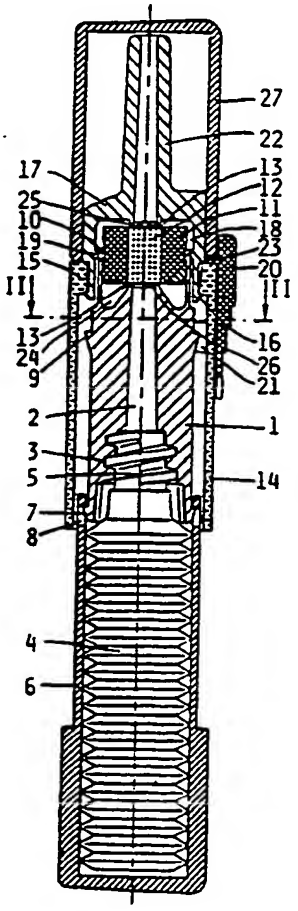
(54) Title: DISPOSABLE DISPENSER FOR POWDER

(57) Abstract

A disposable dispenser for powders comprising in a housing (14; 31) a member (1; 33) having a central passage (2; 32) communicating at its one end with a chamber (34) in which the air may be pressurized by pressing a bellows (4) or a plunger (37), and at its other end with a penetrator (26; 47) for penetrating a membrane (13) closing one end of a tubular powder magazine (11; 36) sealingly held in a socket (10; 35) surrounding the penetrator (26; 47). The other end of the magazine (11; 36) is closed by a similar membrane and is located in proximity of an inlet end of a dispensing pipe (22; 45). When the pressurizing means i.e the bellows (4) or the plunger (37) is pressed it is maintained in its compressed condition keeping the air in the chamber and the passage underpressure. By removing a cap (27; 44) covering the outlet end of the dispensing pipe (22; 45) a button (20; 42) is set free to be moved to bring the inlet end of the dispensing pipe (22; 45) and the penetrator (26; 47) towards each other to cut the membranes (13) at both ends of the magazine to relieve the pressure in the chamber (34) and the passage (2; 32) through the bore (12) of the magazine and the dispensing pipe (22; 45) and thereby dispense the powder stored in the magazine.



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DISPOSABLE DISPENSER FOR POWDER

The invention concerns a disposable dispenser for powder, and more specifically a dispenser for dispensing a dosage of a powdery drug into the nasal cavity.

For the dispensing of powdery medicine which can be absorbed through the nasal mucous membranes and which is only given occasionally, e.g. emergency administration of glucagon for treating hypoglycaemic diabetics, it is an object of the invention to provide a disposable dispenser which can be used for storing an appropriate dosage of a powdery drug, which easily can be used for administration of this dosage when necessary, and which is so cheap that it can be disposed of after use.

From US 2,672,144 is known a disposable powder dispenser having the powdery drug stored in a bottle shaped vessel also containing a charge of compressed gas and sealed at the end of the bottle neck with a sealing which may be broken by a penetrator when the vessel is pressed into the dispenser unit. By using this dispenser care must be taken to ensure that the powder is passed up into the bottle neck - a precaution which cannot be expected to be taken by unprofessionals in an emergency situation. Further, the compressed gas may leak during storage, and consequently the dispenser may be unusable when the emergency situation occurs.

The objects of the invention are attained by a dispenser for powder, which according to the invention comprises a member having a central passage communicating at one end with a chamber having means for pressurizing the air in the chamber, and at the other end with means for penetrating a membrane closing one end of a tubular powder magazine sealingly held in a socket surrounding the penetrating means, the other end of the magazine being closed by another membrane and being located in proximity of an inlet end of a dispensing pipe, and a release button at the outside of the dispenser connected to the member to release the pressurized air in the chamber and

the passage through the magazine and the dispensing pipe by axially displacing the member to bring this member and the dispensing pipe towards each other so that the membranes of the magazine are cut through by the penetrating means at the end of the member and by similar means at the inlet end of the dispensing pipe.

According to the invention the means for pressurizing the air may comprise an elongated cylindric housing being at its end opposite the communication to the member closed by a plunger which may be passed into the housing to compress the air in the chamber.

According to the invention means may be provided for locking the plunger in an inner position to maintain the air in the chamber pressurized. Such means may be a circumferential snap lock hook at the inner end of the plunger engaging a circumferential recess in the inner wall of the housing at the inner end of this housing.

According to the invention the means for pressurising the air may alternatively comprise an axial compressible bellows surrounded by a cup shaped cover, the side wall of which may pass into the housing when the cover is pressed to pressurize the air in the bellows.

To lock the bellows in its compressed condition the edges of the open end of the cover may be provided with recesses which may be engaged by protrusions on a body inside the housing when the bellows is compressed.

The outlet end of the dispensing pipe may be covered by a lid, which at the same time blocks the operation of the release button. Thereby it is ensured that the release button is not operated until the lid has been removed.

To make it possible to displace the member axially in the housing annular walls perpendicular to the axis of the passage may be provided at each end of this passage, and these walls may at their periphery be hinged resiliently to the walls of the socket and the housing, respectively.

In the following the dispenser according to the invention will be described with reference to the drawings, in which

Fig. 1 shows a sectional side view of a dispenser according to the invention,

Fig. 2 shows a sectional view along the line II-II in the dispenser shown in Fig. 1,

Fig. 3 shows a sectional side view of the dispenser shown in Fig. 1 with the bellows compressed and the release button operated,

Fig. 4 shows a sectional side view of another embodiment of the dispenser according to the invention,

Fig. 5 shows the dispenser of Fig. 4 with the plunger in its locked inner position and with the release button operated,

Fig. 6 shows the dispenser in Fig. 5 seen from the right, and with the release button not operated,

Fig. 7 shows a sectional view along the line VII-VII in Fig. 2.

Fig. 8 shows an enlargement of the region around the release button in Fig. 5.

The dispenser shown in Fig. 1 comprises a mainly cylindric body 1 having a central passage 2, and being at its lower end provided with a screw socket 3. An axial compressible bellows 4 closed at its lower end is at its upper end provided with a thread 5 to be screwed into the socket 3.

The bellows is surrounded by a cup shaped cover 6 fitting with a slight play over the body 1 and held on this body by hook shaped protrusions 7 at the lower end of the body 1 engaging recesses 8 at the upper edge of the cover 6. At its upper end the body 1 has similar protrusions 9 to engage the recesses 8 when the bellows has been compressed by pressing the cover 6 over the body 1. Fig. 3 shows the bellows in its com-

pressed position, and the cover in its positions surrounding the body 1 with the protrusions 9 engaging the recesses 8.

At its upper end, the body 1 is provided with a ring snap socket 10 for receiving a tubular powder magazine 11, the bore 12 of which is filled with the medicine to be dispensed, and which at its ends is sealed by a membrane 13.

The body 1 is surrounded by a housing 14 having around its upper edge an inwardly protruding bead 15, over which are snapping hooks 16 on a dispensing pipe unit 17 to fix this unit to the housing. The lower part of the dispensing pipe unit 17 has a cavity 18 for receiving the magazine 11 mounted in the ring snap socket, and guiding knobs 19 in this cavity keep the inlet end of a dispensing pipe 22 aligned with the bore 12 of the magazine 11.

A release button 20 is provided with connection arms 21 which lead through the wall of the housing 14 and are secured to the body 1 by being pressfitted into recesses in this body. The release button further has a protrusion 23 overlying the upper edge of the housing and serving as an abutment for a lid 27 covering the dispensing pipe 22 and fitting over the dispensing pipe unit 17. This way the release button is blocked by its protrusion 23 being locked up between the upper edge of the housing 14 and the lower edge of the lid 27.

When the dispenser is to be used the bellows 4 is compressed by pressing the cover 6 upwards over the body 1 with the side wall of the cover passing into the gap between the housing 14 and the body 1. When pressed to its innermost position the cover 6 is locked to the body 1 by the protrusions 9 engaging the recesses 8. Thereby the bellows 4 remains compressed, and the superatmospheric pressure created in the bellows, the passage, and a chamber 24 beneath the magazine is maintained. The dispenser is now ready for use. The lid 27 is now removed, and the dispensing pipe 22 is passed into the nostril of the patient to whom the medicine is to be administered.

When the release button is passed forwards, the body 1 with the magazine 11 placed in the socket 10 is pressed towards the inlet end of the dispensing pipe. This end has around the bore of the pipe a sharp brim 25 cutting through the membrane 13 at the upper end of the magazine, and sealing around the bore of the magazine. When the button 20 is passed further forwards, the magazine now abutting the inner side of the dispensing pipe unit around the inlet end of the dispensing pipe is pressed downwards in the socket until the membrane 13 at its lower end is cut through by another sharp brim 26 around the upper end of the passage. When this membrane is cut through, the superatmospheric pressure in the bellows 4 and the passage 2 is released through the bore 12 of the magazine 11 and through the dispensing pipe 22, and the air flow will entrain the powdery medicine in the magazine bore and dispense it into the nasal cavity of the patient. It shall be noticed that the brims 25,26 cutting the membranes 13 are not cutting this membrane all the way around, but are letting a thin string of material remain to connect the part cut free to the rest of the membrane. It is thereby prevented that parts of the membrane are passed with the air flow into the nasal cavity of the patient.

The dispenser shown in Fig. 4 comprises a housing 31 formed by an elongated cylindric sleeve which is open at one end and at the other end passes into a chamber 34 having a reduced outer diameter and communicating at its end opposite the sleeve with a passage 32 in a member 33 connected to an end wall of the chamber 34.

The member 33 has at its end opposite the chamber 34 a socket 35 which sealingly receives a tubular powder magazine 36 which is closed at its ends by membranes to confine a powder in its bore.

A plunger 37 fits into the open end of the sleeve shaped housing 31 and a sealing O-ring 38 in a recess at the inner end of the plunger enables the plunger to pressurize the

air in the sleeve, the chamber, and the passage when the plunger is pressed into the sleeve.

Near its open end the housing 31 has in its inner wall a circumferential recess 53 in which the O-ring 38 may rest to secure the plunger 37 in its outermost position. In this inner wall an axial recess 54 is also provided extending from the open end of the housing a little further inwards than the circumferential recess 53. The axial recess 54 permits the air to escape when the plunger is inserted in the housing and permits equalizing of pressure differences between the inner of the house and the atmosphere, as long as the plunger is not pressed further into the housing.

To maintain the super atmospheric pressure when the plunger is pressed into the sleeve the plunger is at its inner end provided with a circumferential hook 39 engaging a circumferential recess 40 in the inner wall of the sleeve at the inner end of this sleeve.

A unit 41 forming at one end a nose piece to be passed into a nostril of the user of the dispenser, and at the other end a tubular cover having an outer diameter corresponding to that of the housing 31 to flush with the outer wall of this housing when the cover is passed over the chamber part with the reduced outer diameter. A snap lock maintains the unit in its position in extension of the housing.

A release button 42 has connection arms 43 leading through the wall of the tubular part of the unit 41 and being secured in the member 33 by being press fitted into recesses in this member.

When the dispenser is to be used the plunger 37 is pressed into the housing 31 and is maintained in its innermost position by the hook 39 engaging the recess 40. A cap 44 covering the nose piece is removed and the nose piece is inserted in a nostril of the patient to whom the medicine is to be administered.

When the release button 42 is passed forwards, the member 33 with the magazine 36 placed in the socket 35 is

pressed towards the inlet end of a dispensing pipe 45 formed by the unit 41, the link between the side walls and the end wall of the chamber 34 being flexible permitting the member 33 to be moved axially in relation to the chamber 34. In the inlet end a cutting tool 46 is mounted to cut through the closing membrane at one end of the magazine 36. When the membrane is cut the inlet end of the dispensing pipe 45 seals against the edge of the bore of the magazine and fixes the magazine.

When the release button 42 is passed further forwards, the end of the member 33 opposite the chamber 34, through which end the passage 32 opens through the bottom of the socket 35, will be passed towards the other end of the magazine, the connection between the bottom and the walls of the socket being flexible. In the socket 35 the mouth of the passage is provided with a cutting tool 47 corresponding to the tool 46 in the inlet end of the dispensing pipe 45, and the tool 47 will cut the membrane closing the upstream end of the magazine. Thereby the pressurized air in the chamber is released through the magazine and the dispensing pipe and the air flow will entrain the powder in the magazine 36 into the nostril of the user of the dispenser.

The cutting tools 46 and 47 are here shown as parts inserted in the inlet end of the dispensing pipe 45 and in the mouth of the passage 32 in the socket 35. However, the cutting tools may be moulded as integral parts of the pipe 45 and the member 33.

As shown in Fig. 6, the release button 42 may bear a symbol 38 indicating that this button should be passed in the direction towards the dispensing end.

In figure 8, an enlargement of the region around the release button 42 is shown. This button 42, which is slidable along the outer wall of the unit 41, is secured to the member 33 through arms 43 and is on its surface facing the unit 41 provided with a cam 49 engaging an opening 50 in the wall. Thereby, the button 42 is prevented from being inadvertently pushed forward. A force sufficient to make the cam ride over a

rib 51 separating the opening 50 from another opening 52 in the wall of the unit 41 is necessary to release the device. The front end of the cam 49 and the rear side of the rib 51 are inclined, whereas the front side of the rib 51 and the rear end of the cam 49 are perpendicular to the axis of the device thereby providing a detent mechanism allowing the button 42 to be passed forward, but not to be returned. In its non-returnable forward position with its cam 49 resting in the opening 52 the button 42 will make it impossible to put on the cap 44 as the front end of the button will block the thread or the snap lock intended to receive this cap. This way, the device will when used change its appearance in a way leaving no doubt that it is used and may be disposed of.

CLAIMS

1. A dispenser for powder, **characterized in**, that it comprises a member having a central passage communicating at one end with a chamber having means for pressurizing the air in the chamber, and at the other end with means for penetrating a membrane closing one end of a tubular powder magazine sealingly held in a socket surrounding the penetrating means, the other end of the magazine being closed by another membrane and being located in proximity of an inlet end of a dispensing pipe, and a release button at the outside of the dispenser connected to the member to release the pressurized air in the chamber and the passage through the magazine and the dispensing pipe by axially displacing the member to bring this member and the dispensing pipe towards each other so that the membranes of the magazine are cut through by the penetrating means at the end of the member and by similar means at the inlet end of the dispensing pipe.

2. A dispenser according to claim 1, **characterized** in, that the means for pressurizing the air comprises an elongated cylindric housing being at its end opposite the communication to the member closed by a plunger which may be passed into the housing to compress the air in the chamber.

3. A dispenser according to claim 2, **characterized** in, that means are provided for locking the plunger in an inner position to maintain the air in the chamber pressurized.

4. A dispenser according to claim 3, **characterized** in, that the means for locking the plunger is a circumferential snap lock hook at the inner end of the plunger engaging a circumferential recess in the inner wall of the housing at an inner end of this housing

5. A dispenser according to claim 1, **characterized** in that the means for pressurizing the air comprises an axial compressible bellows surrounded by a cup shaped cover, the side wall of which may pass into the housing when the cover is pressed to pressurize the air in the bellows.

6. A dispenser according to claim 5, **characterized** in that at the edge of the open end of the cover recesses are provided for being engaged by protrusions on a body inside the housing when the bellows is compressed.

7. A dispenser according to any of the preceding claims, **characterized** in that the outlet end of the dispensing pipe is covered by a lid, which at the same time blocks the operation of the release button.

8. A dispenser according to any of the preceding claims, **characterized** in that annular walls perpendicular to the axis of the passage are provided at each end of this passage, these walls being at their periphery hinged resiliently to the walls of the socket and the housing, respectively.

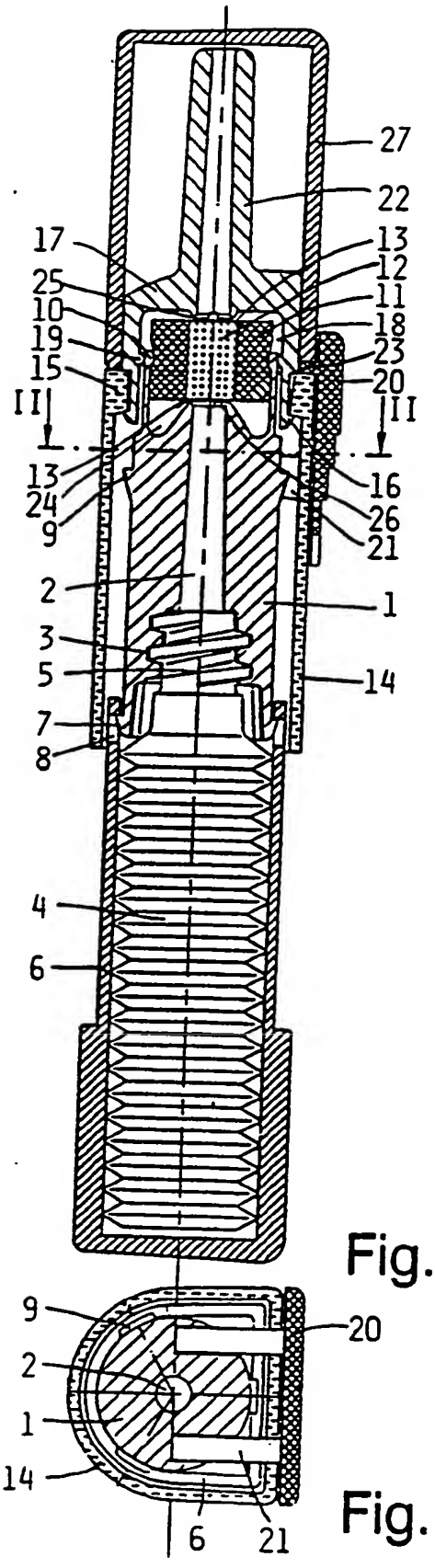

Fig. 1

Fig. 2

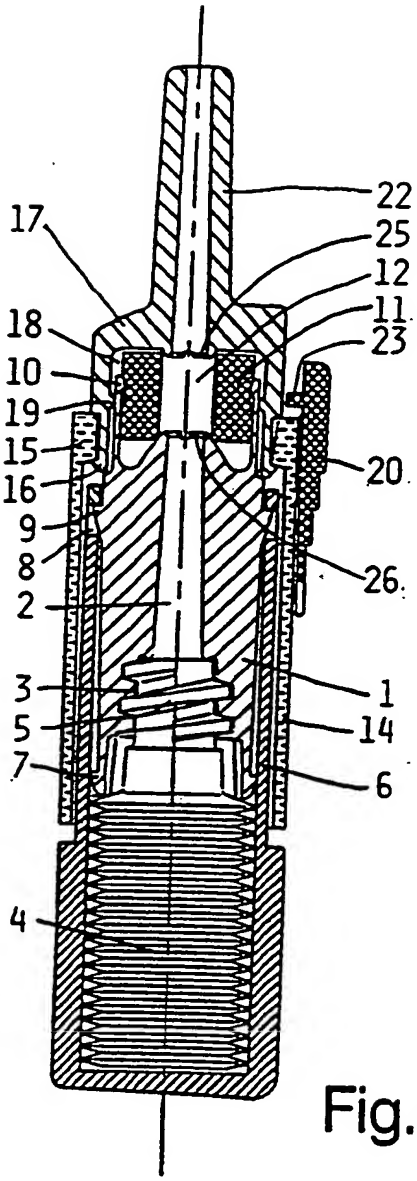

Fig. 3

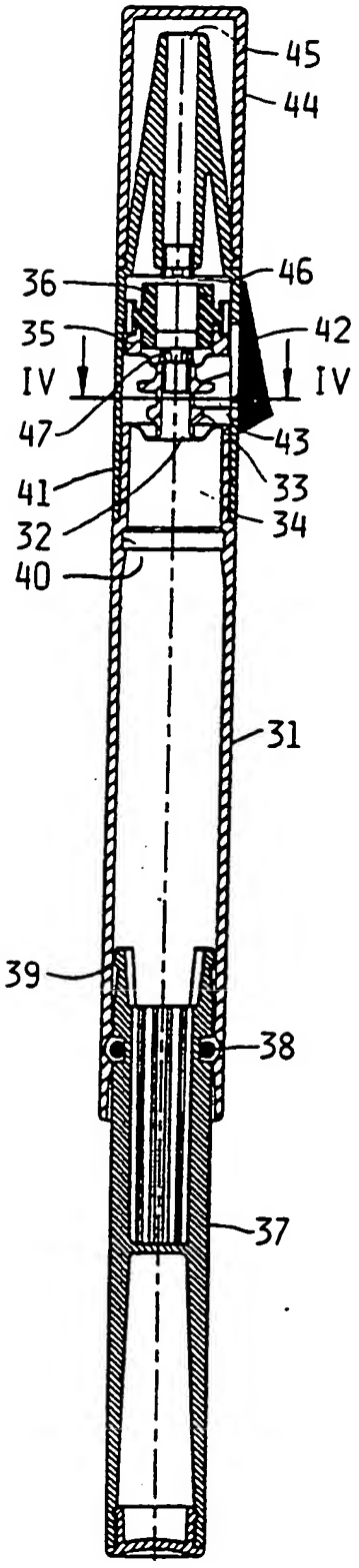

Fig. 4

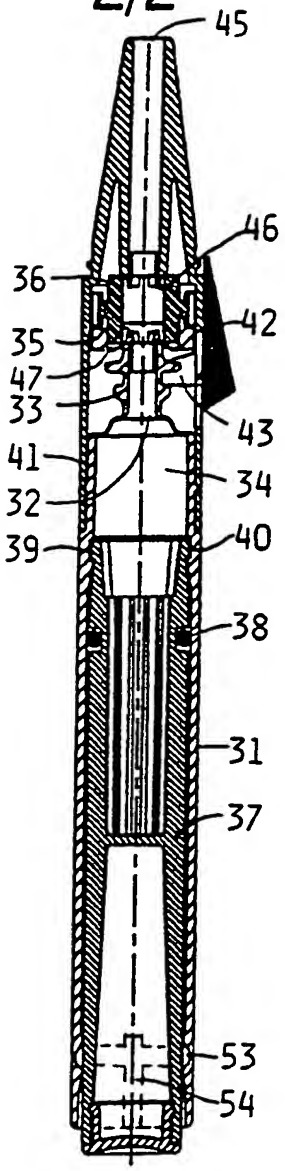

Fig. 5

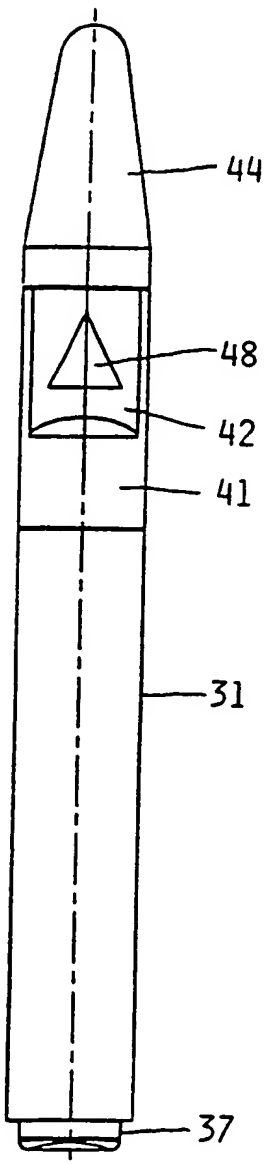

Fig. 6

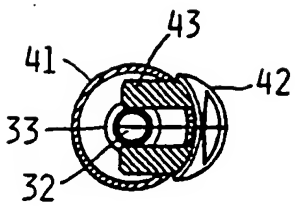

Fig. 7

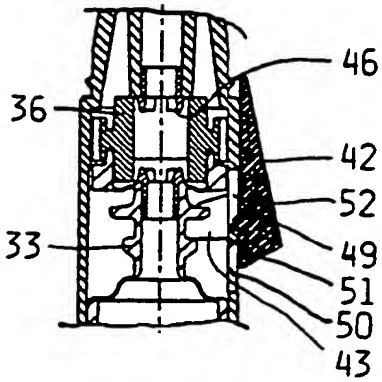

Fig. 8

INTERNATIONAL SEARCH REPORT

International Application No PCT/DK 91/00310

I. CLASSIFICATION OF SUBJECT MATTER (If several classification symbols apply, indicate all)[6]

According to International Patent Classification (IPC) or to both National Classification and IPC

IPC5: A 61 M 15/00

II. FIELDS SEARCHED

Minimum Documentation Searched[7]

Classification System	Classification Symbols
IPC5	A 61 M

Documentation Searched other than Minimum Documentation to the Extent that such Documents are included in Fields Searched[8]

SE,DK,FI,NO classes as above

III. DOCUMENTS CONSIDERED TO BE RELEVANT[9]

Category *	Citation of Document,[11] with indication, where appropriate, of the relevant passages[12]	Relevant to Claim No.[13]
A	US, A, 2307986 (B. BOLTE ET AL) 12 January 1943, see figures 1-4; claim 1 --	1
A	US, A, 2672144 (M.J. COHEN) 16 March 1954, see figures 1-3 --	1
A	WO, A1, 9102558 (BOEHRINGER INGELHEIM INTERNATIONAL GMBHET AL) 7 March 1991, see abstract; figure 3 --	1
A	WO, A1, 9106333 (NOVO NORDISK A/S) 16 May 1991, see abstract; figure 1 --	1

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* Special categories of cited documents:[10]

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IV. CERTIFICATION

Date of the Actual Completion of the International Search	Date of Mailing of this International Search Report
20th January 1992	1992 -01- 22
International Searching Authority	**Signature of Authorized Officer**
SWEDISH PATENT OFFICE	Lena Johansson

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ANNEX TO THE INTERNATIONAL SEARCH REPORT ON INTERNATIONAL PATENT APPLICATION NO.PCT/DK 91/00310

This annex lists the patent family members relating to the patent documents cited in the above-mentioned international search report. The members are as contained in the Swedish Patent Office EDP file on 30/11/91 The Swedish Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

Patent document cited in search report	Publication date	Patent family member(s)		Publication date
US-A- 2307986	43-01-12	NONE		
US-A- 2672144	54-03-16	NONE		
WO-A1- 9102558	91-03-07	AU-D-	6159990	91-04-03
		DE-A-	3927170	91-02-21
WO-A1- 9106333	91-05-16	AU-D-	6617390	91-05-31
		CN-A-	1051304	91-05-15